5.3.5 WATER RESOURCES

5.3.5.1 Short-Term Impacts

Facility disposition activities would be carried out after HLW facilities are no longer operational. HLW facilities would be decontaminated to the extent practicable, then, depending on the facility disposition option selected and the facility in question, they would be entombed and left standing, partially removed, completely removed, or returned to (restricted) industrial use. Long-term impacts to human health from transport of residual contamination in environmental media such as groundwater are discussed in Appendix C.9 and summarized in Section 5.3.8.

New facilities for all alternatives would be located primarily in the northern portion of INTEC. A U.S. Geological Survey modeling study (Berenbrock and Kjelstrom 1998) indicates that those areas are in the 100-year floodplain. However, Big Lost River flows and frequencies based on paleohydrologic geomorphic, stream gauge, and two-dimensional modeling data indicate that no part of INTEC would be inundated by Big Lost River 100- and 500-year flow events (BOR 1999).

Under Clean Closure, radioactive and hazardous constituents would be removed from the site or treated so that residual contamination is no higher than background levels. This could require removal of all buildings, vaults, tanks, transfer piping, and contaminated soil. Under Clean Closure, no post-closure monitoring would be required because potential sources of contamination would no longer be present. Unrestricted industrial use of clean-closed facilities and sites will be permissible. Impacts to water resources would not be expected for this alternative.

For Performance-Based Closure, most above-ground structures would be razed and most below-ground structures (tanks, vaults, and transfer piping) would be decontaminated, stabilized with grout, and left in place. The concentration of residual waste would be reduced to meet the closure performance standard(s) in an approved closure plan. Under Performance-Based Closure, small amounts of residual waste could leach into groundwater; however, concentrations of these wastes in groundwater would be below levels known to cause adverse health effects (see Section 5.3.8). The closed facility would be monitored for the long term, as would groundwater in the vicinity.

For the Closure to Landfill Standards Alternative, waste residues within tanks, vaults, and piping would be stabilized with grout to minimize the release of contaminants into the environment. An engineered cap would be placed over vaults and tanks to minimize the intrusion of water that could leach waste residues into the environment. The structural integrity and effectiveness of the cap would be monitored in accordance with state and Federal regulations for closure effectiveness, as would groundwater in the vicinity. Closure to Landfill Standards would also have potential for impacts to water resources because waste residues would be left in place, although stabilized with grout. Section 5.3.8 analyzes potential human health impacts from these residual concentrations of contaminants.

Under Performance-Based Closure with Class A Grout Disposal, facilities would be closed as described under the Performance-Based Closure Alternative, but following completion of these activities low-level waste Class A type grout (produced under the Full Separations Option or Planning Basis Option) would be disposed of in the Tank Farm and bin sets. Under this alternative, small amounts of residual waste could leach into groundwater; however, concentrations of these wastes in groundwater would be below levels known to cause adverse health effects (see Section 5.3.8). The closed facility would be monitored for the long term, as would groundwater in the vicinity.

Under Performance-Based Closure with Class C Grout Disposal, facilities would be closed as described under the Performance-Based Closure Alternative, but following completion of these activities low-level waste Class C type Grout (produced under the Transuranic Separations Option) would be disposed of in the Tank Farm and bin sets. Under this alternative, small amounts of residual waste could leach into groundwater; however, concentrations of these wastes in groundwater would be below levels known to cause adverse health effects (see Section 5.3.8). The closed facility would be monitored for the long term, as would groundwater in the vicinity.

5.3.5.2 Long-Term Impacts

In addition to the short-term impacts evaluated in Section 5.3.5.1, DOE has also calculated the potential long-term impacts that may occur as a result of closure activities. Because the residual contamination that could be released to the environment is underground, the primary means by which contamination could reach receptors is through leaching into the soil surrounding the facilities and eventually into aquifers near the facilities.

DOE performed modeling of the movement of contaminants using the computer codes MEPAS and TETRAD. Contaminants were postulated to leach from the facilities following an assumed instantaneous structural failure at 500 years post-closure. After this structural failure occurs, rainwater is assumed to infiltrate and leach some of the contaminants and transport them downward to the aquifer.

DOE calculated the maximum concentration of the individual contaminants in the aquifer for comparison to the EPA drinking water standards in 40 CFR 141. Concentrations of nonradiological constituents may be directly compared to the standards while beta-gamma emitting contaminants must be compared to the Drinking Water Standards in terms of radiation dose based on a postulated individual who drinks the water.

Table 5.3-7 shows a comparison of the concentrations (for nonradiological constituents), radiation dose (for radiological contaminants), and Drinking Water Standards for the various facility disposition alternatives. As the table demonstrates, there are no instances where the peak groundwater concentration would exceed the respective maximum contaminant level.

Table 5.3-7. Comparison of groundwater quality with Maximum Contaminant Levels in 40 CFR 141.

Contaminant	No Action	Performance-Based Closure/closure to Landfill Standards	Performance-Based Closure with Class A type grout disposal	Performance-Based Closure with Class C type grout disposal	Disposal of Class A type grout in low-activity waste disposal facility	Disposal of Class C type grout in low-activity waste disposal facility	Maximum Contaminant Level
Peak annual dose (millirem per year) [a]							
Iodine-129	0.29	0.45	1.1	2.1	1.1	2.1	4.0[a]
Technetium-99	0.17	7.8×10^{-4}	1.6×10^{-3}	1.6×10^{-3}	3.1×10^{-3}	4.8×10^{-3}	4.0[a]
Peak concentration in aquifer (milligrams per liter)							
Fluoride	0.039	2.5×10^{-4}	0.058	0.13	0.69	0.7	4.0
Nitrate	0.066	1.4×10^{-4}	6.6×10^{-4}	6.6×10^{-4}	2.7×10^{-4}	2.7×10^{-4}	44[b]
Cadmium	1.2×10^{-8}	1.8×10^{-9}	1.5×10^{-8}	1.5×10^{-8}	4.2×10^{-7}	4.5×10^{-7}	0.005

a. Under 40 CFR 141, when multiple beta-gamma emitting radionuclides are present, the maximum contaminant level applies to the total dose from the radionuclides. However, the peak doses from Iodine-129 and Technium-99 do not overlap in time; therefore, it is appropriate to apply the maximum contaminant level to the individual radionuclides.

b. The maximum contaminant level for nitrate is expressed in 40 CFR 141 as 10 mg/L for the nitrogen component, which equates to approximately 44 mg/L of nitrate.

5.3.6 ECOLOGICAL RESOURCES

Facility disposition includes a number of activities that would occur after HLW facilities are no longer operational. After waste management operations are completed, HLW treatment and storage facilities at INTEC would be deactivated. DOE (1997) discusses the changing mission of INTEC and the planned disposition of surplus facilities. It notes that DOE's goal is to place surplus INEEL facilities in a safe, stable shutdown condition and monitor them while awaiting decommissioning. HLW facilities would be decontaminated to the extent practicable, then, depending on the facility disposition option selected and the facility in question, they would be entombed and left standing, partially removed, completely removed, or returned to (restricted) industrial use. Potential impacts to ecological resources from facility disposition activities were evaluated by reviewing closure plans and project data sheets for disposition of HLW facilities.

After closure, and during the institutional control period, from present to 2095, most areas within the INTEC boundaries will likely be designated restricted-use industrial areas. This use would be consistent with the long-term planning strategy outlined in DOE (1997), which encourages development in established facility areas such as INTEC and discourages the development of undisturbed areas. Following the period of institutional control, legal and administrative use restrictions may be placed on the land. However, for purposes of the analysis in this EIS, the loss of institutional control also means the loss of legal and administrative restrictions, such as deed restrictions. This being the case, any use may be made of the land, including residential or farming, though this is unlikely.

The methods used in this section are the same as those described in Section 5.2.8.

5.3.6.1 Short-Term Impacts

The facility disposition options being considered would primarily affect previously disturbed areas within the existing perimeter of INTEC. None of the closure options being considered would require construction of new facilities outside the existing secure INTEC perimeter. Therefore, no loss or alteration of habitat would occur.

Based on the number of employees required to disposition new facilities (see Section 5.3.2), the largest impacts to ecological resources would be for the Full Separations Option, followed by the Direct Cement Waste Option, Planning Basis Option, Transuranic Separations Option, Hot Isostatic Pressed Waste Option, and Early Vitrification Option. Facility disposition activities under these options would expose wildlife to movement of personnel and vehicles, noise (from construction equipment, trucks, buses, and automobiles), and night lighting for as long as 4 years. Because the INTEC area provides poor-quality wildlife habitat, impacts would be limited to disturbance of wildlife in areas adjacent to INTEC. Representative impacts would include disruption of normal feeding, foraging, and nesting activities and, if the intensity of the disturbance is sufficient, displacement of less disturbance tolerant individuals. Other alternatives and options would require fewer employees and would produce generally lower levels of disturbance.

For disposition of existing facilities, the largest impacts would be expected under Clean Closure of the Tank Farm and under Performance-Based Closure of the bin sets. Impacts would be similar to those described in the previous paragraph but would be smaller because fewer employees would be required to disposition these existing facilities.

5.3.6.2 Long-Term Impacts

DOE has evaluated the potential for long-term impacts on the ecology surrounding the facilities after disposition decisions are enacted. Residual contamination at INTEC would occur in the soil or on buried facility surfaces either below grade or within above-grade engineered soil covers. Contaminants could be transported and spread by leaching into the aquifer or by erosion or penetration of contaminated soil by plant roots and vertebrate and invertebrate burrowing animals. This would result in a contaminant pathway to biological receptors. Contaminants brought to the surface may also be carried offsite by animals as plant material or prey or washed into the Big Lost River by erosion. DOE does not foresee that contaminants would concentrate in individuals of a certain species. There is no reason to anticipate long-term impacts to ecological resources within or near the INTEC boundaries.

5.3.7 TRAFFIC AND TRANSPORTATION

No waste or other materials would be shipped offsite from facility disposition activities, so DOE would not expect transportation impacts. This section analyzes impacts to traffic on Highway 20 (from Idaho Falls to INEEL) from workers involved with facility disposition activities.

5.3.7.1 Methodology for Traffic Impact Analysis

DOE assessed potential traffic impacts based on the number of employees associated with the disposition of each facility or group of facilities (Section 5.3.2). The impacts associated with facility disposition activities were evaluated relative to baseline or historic traffic volumes on Highway 20. Changes in traffic were used to assess potential changes in level-of-service on the road.

Section 5.2.9 describes the methodology used in the determination of level of service on Highway 20. The level of service is a qualitative measure of operational conditions within a traffic stream as perceived by motorists and passengers. A level-of-service is defined for each roadway or section of roadway in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety (TRB 1985).

5.3.7.2 Traffic Impacts

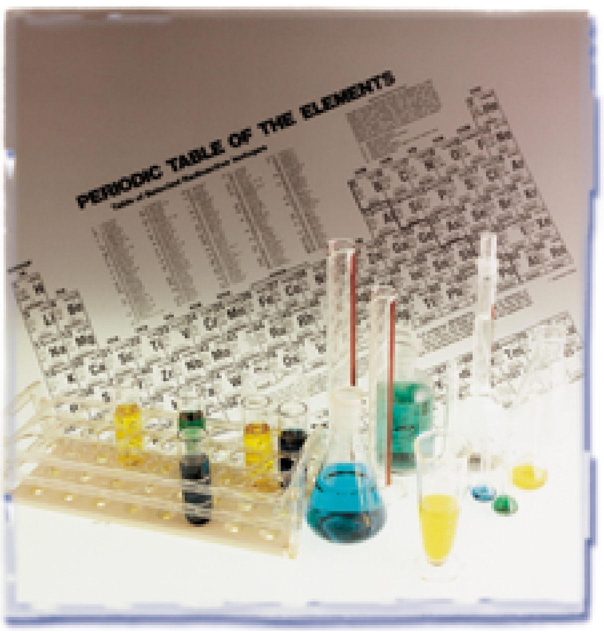
As noted previously in Section 5.2.9, Highway 20 between Idaho Falls and INEEL is designated Level-of-Service A, which represents free flow.

INEEL employment levels are expected to decrease during the period prior to initiation of facility dispositioning activities due to completion of INEEL missions and most waste processing activities. DOE would retrain and reassign its existing workforce to conduct dispositioning activities for both new and existing facilities.

Employment levels for facility dispositioning activities are presented in Table 5.3-1 (new facilities), Table 5.3-2 (Tank Farm and bin sets), and

Table 5.3-3 (existing HLW facility groups). Employment levels for disposition of new facilities would be similar to the levels estimated for construction associated with these facilities. With the exception of the Tank Farm facility, employment levels for dispositioning of existing facilities would be lower than for the waste processing alternatives discussed in Chapter 3.

Based on predicted levels of INEEL employment for facility disposition, DOE expects that traffic flows for Highway 20 would be virtually unaffected and the level of service would remain the same.



5.3.8 HEALTH AND SAFETY

This section describes potential health and safety impacts to INEEL workers and the offsite public from implementation of the facility disposition alternatives described in Chapter 3.

5.3.8.1 Short-Term Impacts

Short-term activities toward facility disposition could result in health impacts to INEEL workers and the public. DOE is considering two categories of disposition of HLW facilities. The first involves disposition of new facilities required to support the waste processing alternatives. The second category involves the existing HLW facilities as grouped in Table 3-4 in Chapter 3. The sections below provide DOE's estimates of radiological and nonradiological health and safety impacts for these facilities.

Impacts from Dispositioning New Facilities Associated with Waste Processing Alternatives

Tables 5.3-8 through 5.3-10 present potential health and safety impacts to involved workers from radiological and nonradiological sources by facility or groups of facilities for new facilities associated with the HLW waste processing alternatives.

Table 5.3-8 presents radiological impacts in terms of collective dose to workers and the resultant estimated number of latent cancer fatalities (LCFs) for the entire period of dispositioning. DOE bases dose estimates on the projected number of workers for each option and historic INEEL operations dose-per-worker data. No dispositioning activities would be associated with the No Action Alternative. The highest annual average collective dose would occur for the Planning Basis Option with 140 person-rem. The Full Separations Option would be the second highest with a dose of 120 person-rem. Likewise, DOE expects the highest total collective dose for the entire dispositioning period to occur for the Planning Basis Option because this option would yield several projects that would require more workers. The total collective worker dose is estimated to be 295 person-rem and would result in 0.10 LCF under this option.

Table 5.3-9 provides a summary of annual radiation dose and health impacts associated with airborne radionuclide emissions. These values are based on the doses for closing each new facility presented in Section 5.3.4. Dose impacts are presented for the maximally exposed offsite and onsite individuals and the population within 50 miles of INEEL. The estimated increase in the number of LCFs is presented for the collective population. The annual radiation doses to the maximally-exposed individuals (onsite and off-

Table 5.3-8. Estimated radiological impacts to involved workers during dispositioning activities for new facilities.

Project number	Description	Workers/year	Total workers	Average annual dose (millirem/year)	Processing time (years)	Annual collective dose (person-rem/year)	Total dose (person-rem)	Estimated increase in latent cancer fatalities
Continued Current Operations Alternative								
P1A[a]	Calcine SBW including New Waste Calcining Facility Upgrades	37	74	250	2	9.3	19	0.01
P1A[b]	Calcine SBW including New Waste Calcining Facility Upgrades	31	62	250	2	7.8	16	0.01
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste Management	36	36	250	1	9	9	0.00
P1F	Bin Set 1 Closure	110	220	250	2	28	55	0.02
P18MC	Remote Analytical Laboratory Operations	30	60	250	2	7.5	15	0.01
Totals		240	450			62	110	0.05
Full Separations Option								
P9A	Full Separations	100	310	250	3	26	77	0.03
P9B	Vitrification Plant	45	140	250	3	11	34	0.01
P9C	Class A Grout Plant	74	220	250	3	19	56	0.02
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P118	Separations Organic Incinerator	2	4	250	2	0.5	1	0.00
P27	Class A Grout Disposal in New INEEL Landfill Facility	88	180	250	2	22	44	0.02
P35D	Class A Grout Packaging and Shipping to INEEL Landfill	20	40	250	2	5	10	0.00
Totals		460	1.0×10^3			120	260	0.10
Planning Basis Option								
P1A[a]	Calcine SBW including New Waste Calcining Facility Upgrades	37	74	240	2	9.3	19	0.01
P1A[b]	Calcine SBW including New Waste Calcining Facility Upgrades	31	62	250	2	7.8	16	0.01
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste	36	36	250	1	9	9	0.00
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P23A	Full Separations	100	310	250	3	26	77	0.03
P23B	Vitrification Plant	49	130	250	2.8	12	34	0.01
P23C	Class A Grout Plant	67	180	250	2.8	17	46	0.02
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P118	Separations Organic Incinerator	2	4	250	2	0.5	1	0.00
P35D	Class A Grout Packaging and Shipping to INEEL Landfill	20	40	250	2	5	10	0.00
P27	Class A Grout Disposal in New INEEL Landfill Facility	88	180	250	2	22	44	0.02
Totals		560	1.2×10^3			140	300	0.10

Table 5.3-8. Estimated radiological impacts to involved workers during dispositioning activities for new facilities (continued).

Project number	Description	Workers/year	Total workers	Average annual dose (millirem/year)	Processing time (years)	Annual collective dose (person-rem/year)	Total dose (person-rem)	Estimated increase in latent cancer fatalities
	Transuranic Separations Option							
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P49A	TRU/Class C Separations	81	240	250	3	20	61	0.02
P49C	Class C Grout Plant	64	130	250	2	16	32	0.01
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P118	Separations Organic Incinerator	2	4	250	2	0.5	1	0.00
P27	Class A Grout Disposal in New INEEL Landfill Facility	88	180	250	2	22	44	0.02
P49D	Class C Grout Packaging and Shipping to INEEL Landfill	41	82	250	2	10	21	0.01
Totals		410	800			100	200	0.08
	Hot Isostatic Pressed Waste Option							
P1A[a]	Calcine SBW including New Waste Calcining Facility Upgrades	37	74	250	2	9.3	19	0.01
P1A[b]	Calcine SBW including New Waste Calcining Facility Upgrades	31	62	250	2	7.8	16	0.01
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste Management	36	36	250	1	9	9	0.00
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P71	Mixing and Hot Isostatic Pressing	150	730	190	5	28	140	0.06
P72	Mixing and Hot Isostatic Pressed Waste	16	48	250	3	4	12	0.00
Totals		400	1.1×10^3			91	230	0.09
	Direct Cement Waste Option							
P1A[a]	Calcine SBW including New Waste Calcining Facility Upgrades	37	74	250	2	9.2	19	0.01
P1A[b]	Calcine SBW including New Waste Calcining Facility Upgrades	31	62	250	2	7.8	16	0.01
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste Management	36	36	250	1	9	9	0.00
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P80	Direct Cement Process	120	360	250	3	30	91	0.04
P81	Unseparated Cementitious HLW Interim Storage	90	260	250	3	22	66	0.03
Totals		450	960			110	240	0.10

Table 5.3-8. Estimated radiological impacts to involved workers during dispositioning activities for new facilities (continued).

Project number	Description	Workers/year	Total workers	Average annual Rad dose (millirem/year)	Processing time (years)	Annual collective dose (person-rem/year)	Total dose (person-rem)	Estimated increase in latent cancer fatalities
	Early Vitrification Option							
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P61	Unseparated Vitrified Product Interim Storage	25	76	250	3	6.3	19	0.01
P88	Early Vitrification with MACT	78	390	250	5	20	98	0.04
Totals		240	630			59	160	0.06
	Minimum INEEL Processing Alternative							
P18	New Analytical Laboratory	30	60	250	2	7.5	15	0.01
P24	Vitrified Product Interim Storage at INEEL	3	9	250	3	0.75	2.3	0.00
P27	Class A Grout Disposal in New INEEL Landfill Facility	88	180	250	2	22	44	0.02
P111	SBW & NGLW Treatment with CsIX to CH TRU Grout & LLW Grout	59	59	250	1	15	15	0.01
P59A	Calcine Retrieval and Transport	100	100	250	1	26	26	0.01
P117A	Packaging & Loading Calcine for Transport to Hanford	33	99	250	3	8.3	25	0.01
Totals		320	510			79	130	0.05

a. For the New Waste Calcining Facility MACT Facility.
b. For the liquid waste storage tank.
CH TRU = contact-handled transuranic waste; CsIX = cesium ion exchange; LLW = low-level waste; MACT = Maximum Achievable Control Technology; NGLW = newly generated liquid waste; TRU = transuranic.

Table 5.3-9. Summary of radiation dose impacts associated with airborne radionuclide emissions from dispositioning of facilities associated with waste processing alternatives.

Case[a] (units)	No Action Alternative	Continued Current Operations Alternative	Separations Alternative			Non-Separations Alternative			Minimum INEEL Processing Alternative
			Full Separations Option[b]	Planning Basis Option	Transuranic Separations Option[c]	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	
Dose to maximally-exposed offsite individual (millirem per year)	-	1.1×10^{-10}	3.3×10^{-10}	4.4×10^{-10}	4.7×10^{-10}	1.8×10^{-10}	1.3×10^{-10}	1.4×10^{-10}	3.7×10^{-10}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	-	5.5×10^{-17}	1.7×10^{-16}	2.2×10^{-16}	2.4×10^{-16}	9.0×10^{-17}	6.5×10^{-17}	7.0×10^{-17}	1.9×10^{-16}
Dose to noninvolved worker (millirem per year)[d]	-	2.0×10^{-11}	6.0×10^{-11}	8.0×10^{-11}	1.4×10^{-10}	3.7×10^{-11}	2.1×10^{-11}	2.8×10^{-11}	1.1×10^{-10}
Estimated annual increase in probability of LCF to the noninvolved worker	-	8.0×10^{-18}	2.4×10^{-17}	3.2×10^{-17}	5.6×10^{-17}	1.5×10^{-17}	8.4×10^{-18}	1.1×10^{-17}	4.4×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[e]	-	3.4×10^{-9}	1.0×10^{-8}	1.2×10^{-8}	1.1×10^{-8}	4.7×10^{-9}	3.8×10^{-9}	3.9×10^{-9}	1.3×10^{-8}
Estimated annual increase in number of latent cancer fatalities to population	-	1.7×10^{-12}	5.0×10^{-12}	6.0×10^{-12}	5.5×10^{-12}	2.4×10^{-12}	1.9×10^{-12}	2.0×10^{-12}	6.5×10^{-12}

a. Doses are maximum values over any single year during which decontamination and decommissioning occurs.
b. Impacts do not include disposal of low-level waste Class A type Grout in Tank Farm and bin sets, which is presented in Section 5.3.4, Table 5.3-5.
c. Impacts do not include disposal of low-level waste Class C type Grout in Tank Farm and bin sets, which is presented in Section 5.3.4, Table 5.3-5.
d. Location of highest onsite dose would be Central Facilities Area.
e. Assumes that population would grow from 118,644 in 1990 to about 202,000 during the period of decontamination and decommissioning.

Table 5.3-10. Estimated worker injury impacts during dispositioning activities of new facilities at INEEL by alternative.

Project number	Description	Total number of workers per year	Total number of workers	Processing time (years)	Annual lost workdays[a]	Annual total recordable cases[b]	Total lost workdays	Total recordable cases
Continued Current Operations Alternative								
P1A[c]	Calcine SBW including New Waste Calcining Facility Upgrades	58	120	2	18	2.2	37	4.4
P1A[d]	Calcine SBW including New Waste Calcining Facility Upgrades	42	84	2	13	1.6	27	3.2
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste	48	48	1	11	1.5	11	1.5
P1F	Bin Set 1 Closure	110	220	2	35	4.2	70	8.4
P18MC	Remote Analytical Laboratory Operations	88	180	2	20	2.8	40	5.6
Totals		350	640		110	13	200	25
Full Separations Options								
P9A	Full Separations	220	670	3	71	8.5	210	26
P9B	Vitrification Plant	72	220	3	23	2.7	68	8.2
P9C	Class C Grout Plant	120	360	3	38	4.5	113	14
P18	New Analytical Laboratory	88	180	2	28	3.3	56	6.7
P24	Vitrified Product Interim Storage	31	93	3	9.8	1.2	29	3.5
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	2.1	0.63	0.3	0.66	0.08	0.20	0.02
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1
P118	Separations Organic Incinerator	2	4	2	0.63	0.08	1.3	0.15
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
P35D	Class A Grout Packaging and Shipping to INEEL Landfill	30	60	2	9.5	1.1	19	2.3
P27	Class A Grout Disposal in New INEEL Landfill Facility	140	270	2	43	5.2	86	10
Totals		910	2.2×10^3		290	35	660	80
Planning Basis Option								
P1A[c]	Calcine SBW including New Waste Calcining Facility Upgrades	58	120	2	18	2.2	37	4.4
P1A[d]	Calcine SBW including New Waste Calcining Facility Upgrades	42	84	2	13	1.6	27	3.2
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste	48	48	1	15	1.8	15	1.8
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1
P23A	Full Separations	220	670	3	71	8.5	210	26

Table 5.3-10. Estimated worker injury impacts during dispositioning activities of new facilities at INEEL by alternative (continued).

Project number	Description	Total number of workers per year	Total number of workers	Processing time (years)	Annual lost workdays[a]	Annual total recordable cases[b]	Total lost workdays	Total recordable cases
P23B	Vitrification Plant	72	270	4	23	2.7	75	10
P23C	Class C Grout Plant	120	400	4	34	4.1	130	15
P24	Vitrified Product Interim Storage	31	93	3	9.8	1.2	29	3.5
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	2.1	0.63	0.3	0.66	0.08	0.20	0.02
P18	New Analytical Laboratory	88	180	2	28	3.3	56	6.7
P118	Separations Organic Incinerator	2	4	2	0.63	0.08	1.3	0.15
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
P35E	Class A Grout Packaging and Loading for Off-site Disposal	30	60	2	9.5	1.1	19	2.3
Totals		910	2.2×10^3	23	290	35	690	80
	Transuranic Separations Option							
P18	New Analytical Laboratory	140	270	2	43	5.2	86	10
P27	Class A Grout Disposal in New INEEL Landfill Facility	88	180	2	28	3.3	56	6.7
P39A	Packaging and Loading TRU at INTEC for Shipment to the Waste Isolation Pilot Plant	7	11	1.5	2.2	0.27	3.3	0.40
P49A	TRU/Class C Separations	150	440	3	46	5.6	140	17
P49C	Class C Grout Plant	93	190	2	29	3.5	59	7.1
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1
P118	Separations Organic Incinerator	2	4	2	0.63	0.08	1.3	0.15
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
P49D	Class C Grout Packaging and Shipping to INEEL Landfill	57	110	2	18	2.2	36	4.3
Totals		740	1.5×10^3	18	230	28	460	55
	Hot Isostatic Pressed Waste Option							
P1A[c]	Calcine SBW including New Waste Calcining Facility Upgrades	58	120	2	18	2.2	37	4.4
P1A[d]	Calcine SBW including New Waste Calcining Facility Upgrades	42	84	2	13	1.6	27	3.2
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste	48	48	1	15	1.8	15	1.8
P18	New Analytical Laboratory	88	180	2	28	3.3	56	6.7
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1

Table 5.3-10. Estimated worker injury impacts during dispositioning activities of new facilities at INEEL by alternative (continued).

Project number	Description	Total number of workers per year	Total number of workers	Processing time (years)	Annual lost workdays[a]	Annual total recordable cases[b]	Total lost workdays	Total recordable cases
P71	Mixing and Hot Isostatic Pressing	200	990	5	63	7.5	310	38
P72	Mixing and Hot Isostatic Pressed Waste	150	460	3	49	5.9	150	18
P73A	Packaging and Loading Hot Isostatic Pressed Waste at INTEC for Shipment to a Geologic Repository	7	18	2	2.2	0.27	5.5	0.67
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
Totals		800	2.2×10^3	20	250	30	680	80
	Direct Cement Waste Option							
P1A[c]	Calcine SBW including New Waste Calcining Facility Upgrades	58	120	2	18	2.2	37	4.4
P1A[d]	Calcine SBW including New Waste Calcining Facility Upgrades	42	84	2	13	1.6	27	3.2
P1B	Newly Generated Liquid Waste and Tank Farm Heel Waste	48	48	1	15	1.8	15	1.8
P18	New Analytical Laboratory	88	180	2	28	3.3	56	6.7
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1
P80	Direct Cement Process	160	490	3	52	6.2	160	19
P81	Unseparated Cementitious HLW Interim Storage	290	860	3	91	11	270	33
P83A	Packaging & Loading Cementitious Waste at INTEC for Shipment to a Geologic Repository	7	25	3.5	2.2	0.27	7.7	0.93
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
Totals		900	2.1×10^3	20	280	34	650	78
	Early Vitrification Option							
P18	New Analytical Laboratory	88	180	2	28	3.3	56	6.7
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1
P61	Unseparated Vitrified Product Interim Storage	250	750	3	79	9.5	240	28
P62A	Packaging & Loading of Vitrified HLW at INTEC for Shipment to a Geologic Repository	10	30	3	3.2	0.38	9.5	1.1
P88	Early Vitrification with MACT	110	560	5	35	4.2	180	21

Table 5.3-10. Estimated worker injury impacts during dispositioning activities of new facilities at INEEL by alternative. (continued).

Project number	Description	Total number of workers per year	Total number of workers	Processing time (years)	Annual lost workdays[a]	Annual total recordable cases[b]	Total lost workdays	Total recordable cases
P90A	Packaging & Loading Vitrified SBW at INTEC for Shipment to the Waste Isolation Pilot Plant	7	11	1.5	2.2	0.27	3.3	0.40
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
Totals		670	1.8×10^3	18	210	25	560	67
	Minimum INEEL Processing Alternative							
P18	New Analytical Laboratory	88	180	2	28	3.3	56	6.7
P24	Vitrified Product Interim Storage	31	93	3	9.8	1.2	29	3.5
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	2.1	0.63	0.3	0.66	0.08	0.20	0.02
P27	Class A Grout Disposal in New INEEL Landfill Facility	140	27	2	43	5.2	86	10.3
P59A	Calcine Retrieval and Transport	160	160	1	51	6.1	51	6.1
P111	SBW & NGLW Treatment with CsIX to CH TRU Grout & LLW Grout	100	100	1	33	4.0	33	4.0
P112A	Packaging & Loading Contact Handled TRU (from SBW & NGLW CsIX-Grout Treatment) for Shipment to WIPP	7	32	4.5	2.2	0.27	10	1.2
P117A	Packaging & Loading Calcine for Transport to Hanford	110	320	3	34	4.1	100	12
P133	Waste Treatment Pilot Plant	45	90	2	14	1.7	28	3.4
Totals		680	1.2×10^3	19	220	26	390	47

a. Lost workdays = The number of workdays beyond the day of injury or onset of illness the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

b. Total Recordable Case = A recordable case includes work-related death, illness, or injury which resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.

c. For the New Waste Calcining Facility with Maximum Achievable Control Technology upgrades.

d. For the liquid waste storage tank.

CH TRU = contact-handled transuranic waste; CsIX = cesium ion exchange; FUETAP = formed under elevated temperature and process; HLW = high-level waste; LLW = low-level waste; NGLW = newly generated liquid waste; TRU = transuranic waste; WIPP = Waste Isolation Pilot Plant.

site) as well as to the population for all of the options are at insignificant levels. The maximum number of LCFs is associated with the Planning Basis Option and is much less than one (7.0×10^{-12}).

Table 5.3-10 provides estimates of occupational safety impacts for new and existing workers involved with dispositioning activities. Impacts are presented in terms of the number of lost workdays and total recordable cases on an annual and total dispositioning period basis. A lost workday is the number of lost workdays beyond the onset of injury or illness. A total recordable case is a recordable case that includes work-related death, illness, or injury that resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical attention beyond first aid. DOE estimated the lost workdays and total recordable cases for each option based on the projected number of workers and the five-year average lost workdays and total recordable cases rates from INEEL construction workforce data from 1993 to 1997 (Millet 1998).

As shown in Table 5.3-10, the highest number of lost workdays and total recordable cases during an average employment year would occur under the Full Separations Option and the Planning Basis Option. DOE estimates 290 lost workdays and 35 total recordable cases during an average year under these options. The Hot Isostatic Pressed Waste Option and the Direct Cement Waste Option would present slightly fewer lost workdays and total recordable cases occurrences. All other options would result in fewer occupational safety impacts on an annual basis. The highest impacts for the entire dispositioning period for new facilities associated with waste processing would also be expected under the Planning Basis Option. DOE estimates a total of 690 lost workdays and 80 total recordable cases under this option. The Full Separations Option, Hot Isostatic Pressed Waste Option, Direct Cement Waste Option and the Early Vitrification Option would have a similar number of lost workdays and total recordable cases occurrences with all other options resulting in lesser impacts for the entire dispositioning period of activity.

Impacts from Dispositioning Existing Facilities Associated with HLW Management

Tables 5.3-11 through 5.3-14 present potential health and safety impacts from closure of existing HLW facilities by alternative. These facilities would be closed as specified in Table 3-4.

Table 5.3-11 provides radiological impacts in terms of collective dose to workers and the resultant estimated number of LCFs for the entire dispositioning period of activity. As expected, the collective worker dose is highest for the Tank Farm Clean Closure Alternative due to the extensive decontamination efforts required for removing contaminated materials in order to reduce radioactivity to minimum detectable levels. Tank Farm Clean Closure would involve the largest number of workers and a longer duration of dispositioning activities for any of the Tank Farm options and therefore would result in a larger collective dose. DOE expects the annual collective and total collective worker doses to be 280 and 7,600 person-rem, respectively. The total collective worker dose for the Clean Closure alternative would result in an estimated 3 LCFs. The estimated total collective worker doses for all other Tank Farm closure options, bin sets and related facilities, and other new facilities associated with HLW management are much lower and would result in less than 1 LCF for each option.

Table 5.3-12 provides a summary of annual radiation dose and health impacts associated with airborne radionuclide emissions from the Tank Farm and bin sets under alternative closure scenarios. Dose impacts are presented for the maximally exposed offsite and onsite individuals and the population within 50 miles of INEEL. The highest radiation dose impacts are associated with the Bin Set Closure to Landfill Standards Alternative. However, these doses are still significantly less than the applicable standard for annual exposure. The maximum collective population dose of 5.1×10^{-8} person-rem for the Bin Set Closure to Landfill Standards Alternative results in an increase in the number of latent cancer fatalities of 2.6×10^{-11}. All other radiation dose impacts are lower.

Table 5.3-11. Estimated radiological health impacts from dispositioning activities for existing facilities (annual and total dose).

Facility description	Annual average number of workers	Annual collective worker dose (person-rem)	Total collective dose for dispositioning period (person-rem)	Estimated LCFs from total collective dose (person-rem)
Tank Farm				
Clean Closure	280	280	7,600	3.0
Performance-Based Closure	11	12	270	0.10
Closure to Landfill Standards	11	14	220	0.09
Performance-Based Closure with Class A Grout Disposal	22	16	300	0.12
Performance-Based Closure with Class C Grout Disposal	23	28	490	0.19
Tank Farm related facilities	1.8	0.46	2.3	<0.01
Bin Sets				
Clean Closure	58	35	940	0.38
Performance-Based Closure	49	43	850	0.34
Closure to Landfill Standards	27	19	400	0.16
Performance-Based Closure with Class A Grout Disposal	92	39	950	0.38
Performance-Based Closure with Class C Grout Disposal	98	75	1,200	0.46
Bin Sets related facilities	0.17	0.04	0.26	<0.01
PEWE and related facilities	47	21	130	0.05
Fuel Processing Building and related facilities				
Performance-Based Closure	25	6.3	63	0.03
Closure to Landfill Standards	20	5	50	0.02
FAST/FAST Stack	34	8.4	50	0.02
New Waste Calcining Facility				
Performance-Based Closure	35	8.8	44	0.02
Closure to Landfill Standards	32	8	40	0.02
Remote Analytical Laboratory	6	1.5	15	<0.01

Source: Data from Project Data Sheets in Appendix C.6.
FAST = Fluorinel and Storage Facility; LCF = latent cancer fatality; PEWE = Process Equipment Waste Evaporator.

Table 5.3-13 provides a summary of annual radiation dose and health impacts from radionuclide emissions from the other existing facilities associated with HLW facility dispositioning activities. Dose impacts are presented for the maximally exposed offsite and onsite individuals and the population within 50 miles of INEEL. All of the dose impacts are negligible with the highest collective population dose and increase in number of latent cancer fatalities being estimated for the Fuel Processing Building and Related Facilities. However, all dose impact values are significantly less than one.

Table 5.3-14 provides estimates of occupational safety impacts for new and existing workers involved with dispositioning activities. DOE estimated the lost workdays and total recordable cases for each option based on the projected number of workers and the 5-year average lost workdays and total recordable cases rates from INEEL construction workforce data from 1993 to 1997 (Millet 1998).

As shown in Table 5.3-14, DOE expects the highest number of lost workdays and total recordable cases to occur for the Tank Farm

Table 5.3-12. Summary of radiation dose impacts associated with airborne radionuclide emissions from dispositioning of the Tank Farm and bin sets under alternative closure scenarios.

Case	Applicable standard	Maximum annual radiation dose[a] Clean closure	Performance-based closure	Closure to landfill standards	Performance-based closure with Class A or C grout disposal [b]
Tank Farm					
Dose to maximally exposed offsite individual (millirem per year)	10^{c}	1.2×10^{-9}	1.7×10^{-10}	1.2×10^{-9}	1.5×10^{-10}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	NA	6.0×10^{-16}	8.5×10^{-17}	6.0×10^{-16}	7.5×10^{-17}
Dose to noninvolved worker (millirem per year)[d]	5.0×10^{3e}	1.2×10^{-9}	1.7×10^{-10}	1.2×10^{-9}	1.5×10^{-10}
Estimated annual increase in probability of LCF to the noninvolved work	NA	4.8×10^{-16}	6.8×10^{-17}	4.8×10^{-16}	6.0×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[f]	NA	3.1×10^{-8}	4.3×10^{-9}	3.0×10^{-8}	3.9×10^{-9}
Estimated annual increase in number of latent cancer fatalities to population	NA	1.6×10^{-11}	2.2×10^{-12}	1.5×10^{-11}	2.0×10^{-12}
Bin sets					
Dose to maximally exposed offsite individual (millirem per year)	10^{c}	1.0×10^{-10}	1.3×10^{-10}	9.2×10^{-10}	1.3×10^{-10}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	NA	5.0×10^{-17}	6.5×10^{-17}	4.6×10^{-16}	6.5×10^{-17}
Dose to noninvolved worker (millirem per year)[d]	5.0×10^{3e}	2.3×10^{-11}	3.0×10^{-11}	2.2×10^{-10}	3.0×10^{-11}
Estimated annual increase in probability of LCF to the noninvolved work	NA	9.2×10^{-18}	1.2×10^{-17}	8.8×10^{-17}	1.2×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[f]	NA[g]	5.5×10^{-9}	7.2×10^{-9}	5.1×10^{-8}	7.2×10^{-9}
Estimated annual increase in number of latent cancer fatalities to population	NA	2.8×10^{-12}	3.6×10^{-12}	2.6×10^{-11}	3.6×10^{-12}

a. Doses are maximum values over any single year during which decontamination and decommissioning occur.
b. Radiation dose impacts for Class A and Class C type grouting disposal techniques are the same since analyses indicate that the primary exposure results from the cleaning portion of the operation rather than the filling.
c. EPA dose limit specified in 40 CFR 61.92; applies to effective dose equivalent from air releases only.
d. Location of highest onsite dose is Central Facilities Area.
e. Occupational dose limit per 10 CFR 835.202; applies to sum of doses from all exposure pathways.
f. Applies to future projected population of about 202,000 people.
g. NA = not applicable.

Table 5.3-13. Summary of radiation dose impacts associated with airborne radionuclide emissions from dispositioning other existing facilities associated with HLW management.

		Maximum annual radiation dose[a]						
Case	Applicable standard	Tank Farm related facilities	Bin set related facilities	Process Equipment Waste Evaporator & related facilities	Fuel processing building & related facilities	FAST and related facilities	New Waste Calcining Facility	Remote Analytical Laboratory
Dose to maximally exposed offsite individual (millirem per year)	10[b]	6.7×10^{-11}	1.9×10^{-10}	1.2×10^{-10}	2.4×10^{-10}	8.1×10^{-11}	4.5×10^{-11}	4.1×10^{-11}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	NA	3.4×10^{-17}	9.5×10^{-17}	6.0×10^{-17}	1.2×10^{-16}	4.1×10^{-17}	2.3×10^{-17}	2.1×10^{-17}
Dose to noninvolved worker (millirem per year)[c]	5.0×10^{3}[d]	1.6×10^{-11}	1.9×10^{-10}	1.2×10^{-10}	2.4×10^{-10}	8.1×10^{-11}	1.0×10^{-11}	4.1×10^{-11}
Estimated annual increase in probability of LCF to the noninvolved worker	NA	6.4×10^{-18}	7.6×10^{-17}	4.8×10^{-17}	9.6×10^{-17}	3.2×10^{-17}	4.0×10^{-18}	1.6×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[e]	NA[f]	3.7×10^{-9}	2.6×10^{-9}	3.1×10^{-9}	6.2×10^{-9}	2.1×10^{-9}	2.5×10^{-9}	1.0×10^{-9}
Estimated annual increase in number of LCFs to population	NA	1.9×10^{-12}	1.3×10^{-12}	1.6×10^{-12}	3.1×10^{-12}	1.1×10^{-12}	1.3×10^{-12}	5.0×10^{-13}

a. Doses are maximum values over any single year during which decontamination and decommissioning occurs.
b. EPA dose limit specified in 40 CFR 61.92; applies to effective dose equivalent from air releases only.
c. Location of highest onsite dose is Central Facilities Area.
d. Occupational dose limit per 10 CFR 835.202; applies to sum of doses from all exposure pathways.
e. Applies to future projected population of about 202,000 people.
f. NA = not applicable.

FAST = Fluorinel and Storage Facility.

Source: Data from Project Data Sheets in Appendix C.6.

Table 5.3-14. Estimated worker injury impacts from dispositioning activities for existing facilities.

Facility description	Annual average number of workers	Annual lost workdays[a]	Annual total recordable cases[b]	Total lost workdays	Total recordable cases
Tank Farm					
Clean Closure	280	88	11	2,400	290
Performance-Based Closure	16	3	0	76	10
Closure to Landfill Standards	11	3	0.42	59	6
Performance-Based Closure with Class A Grout Disposal	27	7	0.84	97	9
Performance-Based Closure with Class C Grout Disposal	28	7	0.87	97	9
Tank Farm related facilities	2	1	0.07	4	1
Bin Sets					
Clean Closure	58	18	2	500	60
Performance-Based Closure	55	15	2	310	37
Closure to Landfill Standards	27	9	1	180	22
Performance-Based Closure with Class A Grout Disposal	92	29	3	360	3
Performance-Based Closure with Class C Grout Disposal	100	31	4	380	3
Bin Sets related Facilities	0.27	0.09	0.01	1	0
PEWE and related facilities	52	16	2	99	12
Fuel Processing Building and related Facilities	32	10	1	120	15
Performance-Based Closure	40	130	2	130	15
Closure to Landfill Standards	32	10	1	100	12
FAST/FAST Stack	54	17	2	100	12
New Waste Calcining Facility					
Performance-Based Closure	47	15	2	74	9
Closure to Landfill Standards	44	14	2	70	8
Remote Analytical Laboratory	7	2	0	11	1

a. Lost workdays - the number of workdays beyond the onset of injury or illness.
b. Total recordable case - a recordable case includes work-related death, illness, or injury which resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical attention beyond first aid.
FAST = Fluorinel and Storage Facility; LCF = latent cancer fatalities; PEWE = Process Equipment Waste Evaporator.
Source: Data from Project Data Sheets in Appendix C.6.

Clean Closure Alternative due to the larger number of workers and duration of dispositioning activities associated with that option. DOE expects the annual and total lost workdays to be 88 days and 2,400 days, respectively. The annual and total recordable cases are expected to be 11 cases and 290 cases, respectively. As shown in Table 5.3-14, worker occupational health and safety impacts for all other alternatives would be much lower.

5.3.8.2 Long-Term Impacts

In addition to the short term impacts evaluated in Section 5.3.8.1, DOE has also estimated the potential long-term impacts that may occur as a result of facility disposition activities. Because the residual contamination that could be released to the environment is underground, the primary means by which contamination could reach receptors is through leaching into the soil sur-

rounding the facilities and eventually into aquifers near the facilities.

DOE evaluated the potential for other removal mechanisms for contaminants but has concluded that they are not likely except for the bin sets under the No Action Alternative, for which DOE has postulated a potential air release as discussed in Appendix C.9. For the No Action Alternative for other facilities, the residual contamination would be sufficiently far underground and enclosed within the facilities to preclude access by burrowing animals or weathering. The Performance-Based Closure, Closure to Landfill Standards, and variations of those alternatives involve placement of a cementitous grout material in the facilities, which would further preclude access by burrowing animals or weathering.

DOE evaluated the potential impacts over the 10,000-year period following facility disposition. This timeframe is consistent with the period of analysis for long-term impacts in other DOE EISs. It also represents the longest time period for the performance standards in potentially applicable regulations and DOE Orders governing facility disposition activities. This analysis involved calculating the peak concentration of contaminants in the aquifer and then estimating the impact to an individual who drills a well into the contaminated material.

For radiological constituents, DOE calculated the radiation dose and estimated the corresponding number of LCFs that could result from the radiation exposure. For nonradiological constituents, the cancer risk (for carcinogens) or the hazard quotient (for noncarcinogens) was calculated. A summary of radiation dose is presented for each receptor and facility closure scenario in Table 5.3-15 as lifetime doses in millirem. Table 5.3-15 also provides estimates of additional cancer risk for an assumed population of 1000 people.

Doses are highest for receptor categories under the scenarios that involve either exposure to air releases from a bin set system under the No Action alternative, or exposure to groundwater releases after disposal of Class C grout in INEEL facilities (either in the Tank Farm and bin sets or in a new low-activity waste disposal facility). For all receptors except the INEEL worker and intruders, doses from the groundwater pathway are primarily due to iodine-129 intake via groundwater and food product ingestion. Even under very conservative assumptions (i.e., the maximally exposed resident), these doses are small fractions of those received from natural background sources (typically about 360 millirem per year). Intruder and INEEL worker doses and risks result mainly from external exposure to radionuclides in closed facilities. For intruders, the dose would be highest under the alternative involving disposal of Class C grout in the Tank Farm and bin sets, while for INEEL workers it would be very low in all cases but highest under the No Action scenario. The

Table 5.3-15. Summary of total lifetime radiation dose and excess cancer risk from exposure to radionuclides according to receptor and facility closure scenario.

	Facility closure scenario					
Receptor	No Action	Performance-Based Closure/ Closure to Landfill Standards	Performance-Based Closure with Class A Grout Disposal	Performance-Based Closure with Class C Grout Disposal	Disposal of Class A grout in low-activity waste disposal facility	Disposal of Class C grout in low-activity waste disposal facility
Lifetime radiation dose to potential receptors (millirem)						
Maximally exposed resident farmer	8.7[a]	13	18	50	21	51
Average resident farmer	4.8	2.7	3.7	10	4.2	10
INEEL worker	5.3	8.9×10^{-11}	9.0×10^{-11}	3.8×10^{-9}	8.9×10^{-11}	9.1×10^{-11}
Construction worker	1.4	1.4	2	5.4	2.2	5.4
Indoor worker	1.4	1.4	2	5.4	2.2	5.4
Unauthorized intruder [b]	0.29	0.023	2.4×10^{-3}	1.5	0.023	0.023
Uninformed intruder [c]	0.047	3.8×10^{-3}	7.7×10^{-3}	0.25	3.8×10^{-3}	3.8×10^{-3}
Recreational user	0.22	0.31	0.42	1.2	0.48	1.2
Excess cancer risk (per thousand people) [d]						
Maximally exposed resident farmer	4.4×10^{-3}(e)	6.7×10^{-3}	9.2×10^{-3}	0.025	0.01	0.025
Average resident farmer	2.4×10^{-3}	1.4×10^{-3}	1.9×10^{-3}	5.1×10^{-3}	2.1×10^{-3}	5.1×10^{-3}
INEEL worker	2.7×10^{-3}	4.5×10^{-14}	4.5×10^{-14}	1.9×10^{-12}	4.5×10^{-14}	4.5×10^{-14}
Construction worker	6.9×10^{-4}	7.2×10^{-4}	9.8×10^{-4}	2.7×10^{-3}	1.1×10^{-3}	2.7×10^{-3}
Indoor worker	6.8×10^{-4}	7.2×10^{-4}	9.8×10^{-4}	2.7×10^{-3}	1.1×10^{-3}	2.7×10^{-3}
Unauthorized intruder [b]	1.4×10^{-4}	1.1×10^{-5}	1.2×10^{-6}	7.5×10^{-4}	1.1×10^{-5}	1.1×10^{-5}
Uninformed intruder [c]	2.4×10^{-5}	1.9×10^{-6}	3.9×10^{-6}	1.3×10^{-4}	1.9×10^{-6}	1.9×10^{-6}
Recreational user	1.1×10^{-4}	1.5×10^{-4}	2.1×10^{-4}	5.8×10^{-4}	2.4×10^{-4}	5.8×10^{-4}

a. An air pathway dose of 170 millirem is calculated based on the maximally exposed individual dose due to failure of a single bin set system.
b. Timeframe for receptor exposure is during period of institutional control.
c. Timeframe for receptor exposure is distant future.
d. Assumes that a population of 1,000 local residents is exposed to a similar lifetime dose.
e. The risk from radiation dose due to failure of a single bin set is calculated to be 0.085 latent cancer fatality for an assumed population of 1,000 persons.

magnitude of these external dose estimates is highly influenced by assumed occupancy times and proximity to the bin sets. Under the conditions assumed here, the maximum intruder dose is estimated at about 3 millirem, while the maximum INEEL worker dose would be a small fraction of a millirem.

Nonradiological risks are reported both for cancer and noncancer health effects. Cancer risk is reported in terms of probability of individual excess cancer resulting from lifetime exposure. In the cases assessed here, cancer risk results only from inhalation of cadmium entrained in fugitive dust. Noncancer effects are reported in terms of a health hazard quotient, which is the ratio of the contaminants of potential concern intake to the applicable inhalation or oral reference dose. A hazard quotient of greater than unity indicates that the intake is higher than the reference value. Noncancer risk is incurred from intake of cadmium via ingestion, inhalation and dermal absorption, and fluorides and nitrates via ingestion and dermal absorption.

For all receptors and scenarios, cancer risk from cadmium exposure is very low (less than one in a trillion). Noncancer risk would be higher for

Table 5.3-16. Summary of estimated noncarcinogenic health hazard quotients from exposure to nonradiological contaminants according to receptor and facility closure scenario.

Exposure scenario and pathway	No Action	Performance -Based Closure/ Closure to Landfill Standards	Performance - Based Closure with Class A Grout Disposal	Performance - Based Closure with Class C Grout Disposal	Disposal of Class A grout in low-activity waste disposal facility	Disposal of Class C grout in low-activity waste disposal facility
Health hazard quotient due to cadmium intake						
Maximally exposed resident farmer	4.3×10^{-7}	6.5×10^{-8}	4.6×10^{-7}	4.8×10^{-7}	1.5×10^{-5}	1.6×10^{-5}
Average resident farmer	6.7×10^{-8}	1.0×10^{-8}	7.1×10^{-8}	7.5×10^{-8}	2.3×10^{-6}	2.5×10^{-6}
Construction worker	7.0×10^{-8}	1.1×10^{-8}	7.5×10^{-8}	7.8×10^{-8}	2.4×10^{-6}	2.6×10^{-6}
Indoor worker	7.0×10^{-8}	1.1×10^{-8}	7.5×10^{-8}	7.8×10^{-8}	2.4×10^{-6}	2.6×10^{-6}
Recreational user	3.7×10^{-9}	1.2×10^{-9}	8.7×10^{-9}	9.1×10^{-9}	2.8×10^{-7}	3.1×10^{-7}
Health hazard quotient due to fluoride intake						
Maximally exposed resident farmer	0.08	5.2×10^{-4}	0.12	0.27	1.4	1.4
Average resident farmer	0.04	2.6×10^{-4}	0.058	0.13	0.69	0.71
Construction worker	6.4×10^{-3}	4.2×10^{-5}	9.4×10^{-3}	0.021	0.11	0.11
Indoor worker	6.4×10^{-3}	4.2×10^{-5}	9.4×10^{-3}	0.021	0.11	0.11
Recreational user	1.8×10^{-3}	1.2×10^{-5}	2.6×10^{-3}	4.1×10^{-3}	0.032	0.032
Health hazard quotient due to nitrate intake						
Maximally exposed resident farmer	6.5×10^{-3}	3.0×10^{-5}	1.1×10^{-4}	1.1×10^{-4}	3.0×10^{-5}	3.0×10^{-5}
Average resident farmer	2.9×10^{-3}	1.3×10^{-5}	5.0×10^{-5}	5.0×10^{-5}	1.3×10^{-5}	1.3×10^{-5}
Construction worker	4.0×10^{-4}	1.9×10^{-6}	7.1×10^{-6}	7.1×10^{-6}	1.9×10^{-6}	1.9×10^{-6}
Indoor worker	4.0×10^{-4}	1.9×10^{-6}	7.1×10^{-6}	7.1×10^{-6}	1.9×10^{-6}	1.9×10^{-6}
Recreational user	8.4×10^{-5}	3.9×10^{-7}	1.5×10^{-6}	1.5×10^{-6}	3.9×10^{-7}	3.9×10^{-7}

some receptors and scenarios, most notably those cases involving fluoride releases from landfill disposal of Class A or C grout. In those cases, a hazard quotient of 1.5 is estimated for the maximally exposed resident farmer, due mainly to ingestion of fluoride in groundwater and food products irrigated or raised with contaminated groundwater. The effect of concern for fluoride intake is objectionable dental fluorosis, which is considered more of a cosmetic effect than an adverse health effect (EPA 1998).

Table 5.3-16 presents a summary of noncancer hazard quotients for intakes of fluoride, nitrate, and cadmium.

Additional details on the modeling methodology used by DOE is included in Appendix C.9 of this EIS.

5.3.9 ENVIRONMENTAL JUSTICE

As discussed in Section 5.2.11, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs each Federal agency to "make…achieving environmental justice part of its mission" and to identify and address "…disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." The Council on Environmental Quality, which oversees the Federal government's compliance with Executive Order 12898 and the National Environmental Policy Act, subsequently developed guidelines to assist Federal agencies in incorporating the goals of Executive Order 12898 in the NEPA process. This guidance, published in 1997, was intended to "…assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed."

5.3.9.1 Methodology

The methods used to assess potential environmental justice impacts in Section 5.2.11 (Waste Processing) were also used to assess potential environmental justice impacts during facility disposition. The approach was based primarily on Council on Environmental Quality guidance (CEQ 1997).

Although no high and adverse impacts were predicted for the activities analyzed in this EIS, DOE nevertheless considered whether there were any means for minority or low-income populations to be disproportionately affected. The basis for making this determination would be a comparison of areas predicted to experience human health or environmental impacts with areas in the region of influence known to contain high percentages of minority or low-income populations as reported by the U.S. Bureau of the Census.

5.3.9.2 Facility Disposition Impacts

Relatively small numbers of workers would be required for facility disposition activities. DOE intends to retrain and reassign workers to conduct dispositioning activities to the extent practicable. Any socioeconomic impacts would be positive.

None of the facility disposition alternatives is expected to significantly affect land use, cultural resources, or ecological resources because no previously-undisturbed onsite land would be required and no offsite lands are affected.

DOE estimated emissions of radiological and nonradiological pollutants from dispositioning new and existing facilities required to support the various waste processing alternatives. These emissions would be temporary, lasting for a few (1 to 4) years following the shutdown of a facility. In general, radionuclide emission levels from dispositioning facilities would be lower than those resulting from operating the same facilities. In all cases, doses from dispositioning new facilities would be exceedingly low and a very small fraction of natural background levels and applicable standards. Criteria pollutant levels would remain well below applicable standards for all facility disposition alternatives. Toxic air pollutants would also be well below reference levels for all alternatives.

DOE also assessed the emissions from dispositioning existing facilities including the Tank Farm and bin sets. In all cases, radiological doses from emissions would be low and nonradiological air impacts would be well below applicable standards.

DOE assessed short- and long-term impacts to groundwater that may occur as a result of facility disposition (closure) activities. Depending on the facility disposition alternative selected, small amounts of residual waste could reach into groundwater beneath INTEC. Based on computer modeling results, there are no instances where the peak groundwater concentration of a radiological or nonradiological contaminant would exceed its EPA Drinking Water Standard.

The annual radiation doses to the maximally-exposed onsite and offsite individuals and the offsite public (population within 50 miles of INTEC) from disposition of new facilities would be insignificant. The highest collective dose to the population with 50 miles of INTEC (1.4×10^{-8} person-rem per year) would be associated with disposition of new facilities under the Separations Alternative (Planning Basis Option). This collective dose would be associated with a very small increase (7.0×10^{-12}) in LCF in the population.

The annual radiation doses to the maximally-exposed onsite and offsite individuals and the offsite public (population with 50 miles of INTEC) from disposition of existing waste management facilities would also be very small. The highest collective dose to the population with 50 miles of INTEC (5.1×10^{-8} person-rem per year) would result from Closure to Landfill Standards of the bin sets. This collective dose would be associated with a very small increase (2.6×10^{-11})

in latent cancer fatalities in the population. Impacts from other existing facility disposition alternatives would be lower.

Because facility disposition impacts would be small in all cases, and there is no means for minority or low-income populations to be diproportionately affected, no disproportionately high and adverse impacts would be expected for minority or low-income populations.

As noted in Section 5.3.8, public health impacts from facility disposition activities are based on projected airborne releases of radioactive and nonradioactive contaminants. Because prevailing winds are out of the southwest and northeast (see Section 4.7.1), contaminants released to the atmosphere from INTEC tend to be carried to the northeast (into the interior of INEEL) or southwest (into the sparsely-populated area south and west of INEEL). Minority populations tend to be concentrated south and east of INTEC, in urban areas like Pocatello and Idaho Falls and along the Interstate 15 corridor (see Figure 4-24). The Fort Hall Indian Reservation is also some 40 miles southeast of INTEC (see Figure 4-25). This suggests that minority and low-income populations would not experience higher exposure rates than the general population and that disproportionately high and adverse human health effects for minority or low-income populations would not occur as a result of facility disposition activities at INTEC.

5.3.10 UTILITIES AND ENERGY

Upon completion of waste processing operations, DOE would disposition surplus facilities. Dispositioning activities would result in the consumption of electricity, water, and fossil fuels, and the generation of wastewater.

Table 5.3-17 presents the utility and energy requirements for dispositioning new facilities that would be built to support the waste processing alternatives. Generally, these facilities would be clean-closed in accordance with applicable permits or regulations.

Table 5.3-18 presents impacts for dispositioning the Tank Farm and bin sets by closure alternative. Dispositioning the Tank Farm and bin sets would be a long-term activity because facility closure and operation as a disposal facility could last 20 to 35 years depending on the facility, closure method, and low-level waste fraction disposal option chosen. Closure of the remaining existing HLW generation, treatment, and storage facilities is not longterm compared to the Tank Farm and bin sets.

Table 5.3-19 presents impacts for dispositioning other existing facilities associated with HLW management.

5.3.11 WASTE AND MATERIALS

Waste would be produced as a result of dispositioning new waste processing facilities. Table 5.3-20 summarizes total volumes of industrial, low-level, mixed low-level, and hazardous waste that would be generated from disposition of new facilities under each of the waste processing alternatives. As noted in Section 5.2.13.1, waste volumes have been conservatively estimated predicated on current laws and regulations. Future regulatory changes could affect predicted waste volumes and, in the worst case, some reanalysis could be required to show that predicted impacts are bounding. This analysis could be provided as an addendum to this EIS at some future date. Generation of transuranic waste is not expected under disposition of any of these facilities. These facilities would be closed in accordance with the applicable permits or regulations, and closure activities would be typically between 1 to 5 years in duration. Although the No Action Alternative includes some minor construction actions, the evaluation of impacts presented here assumes it would involve no facility disposition activities.

Table 5.3-21 shows volumes of industrial, low-level, mixed low-level, and hazardous waste that would be generated by disposition of existing HLW management facilities. As with disposition of new facilities, generation of transuranic waste is not anticipated for any of the facilities. Waste generation estimates are presented by facility (or facility grouping) and disposition alternative. Disposition of the Tank Farm and bin sets represents the more complex activities

Table 5.3-17. Utility and energy requirements for dispositioning of new facilities.

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
Continued Current Operations Alternative							
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.14	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
Total			490	0.21	1.2	0.80	1.2
Full Separations Option							
P9A	Full Separations	3	160	0.23	1.3	0.60	1.3
P9B	Vitrification Plant	3	160	0.12	0.41	0.20	0.41
P9C	Class A Grout Plant	2.5	160	0.12	0.67	0.60	0.67
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P24	Vitrified Product Interim Storage at INEEL	Unknown	160	0.03	0.17	0	0.17
P25A	Packaging & Loading Vitrified HLW at INTEC for Shipment to NGR	Unknown	39	0	3.0×10^{-3}	0	3.0×10^{-3}
P27	Class A Grout Disposal in New INEEL Disposal Facility	2	1	0.06	0.76	0	0.76
P35D or P35E	Class A Grout Packaging & Shipping to INEEL Disposal Facility or to Offsite Disposal	2	160	0.02	0.17	0.05	0.17
P59A	Calcine Retrieval and Transport	Unknown	160	0.11	0.90	0.20	0.90
P118	Separations Organic Incinerator	2	8	0.01	0.10	0.03	0.01
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.3×10^{3}	0.84	5.2	1.8	5.2

Table 5.3-17. Utility and energy requirements for dispositioning of new facilities (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Planning Basis Option				
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.19	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
P23A	Full Separations	2	160	0.23	1.3	0.60	1.3
P23B	Vitrification Plant	2	160	0.12	0.44	0.60	0.44
P23C	Class A Grout Plant	2	160	0.12	0.60	0.60	0.60
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P24	Vitrified Product Interim Storage at INEEL	Unknown	160	0.03	0.17	0	0.17
P25A	Packaging & Loading Vitrified HLW at INTEC for Shipment to NGR	Unknown	40	0	3.0×10^{-3}	0	3.0×10^{-3}
P35E	Class A Grout Packaging & Shipping for Offsite Disposal	2	160	0.02	0.17	0.05	0.17
P59A	Calcine Retrieval and Transport	2	160	0.11	0.90	0.20	0.90
P118	Separations Organic Incinerator	2	8	0.01	0.10	0.03	0.10
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.8×10^{3}	1.0	5.6	3.1	5.6

Table 5.3-17. Utility and energy requirements for dispositioning of new facilities (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
Transuranic Separations Option							
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P27	Class A Grout Disposal in New INEEL Disposal Facility	2	1	0.060	0.76	0	0.76
P39A	Packaging and Loading TRU at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	140	0.05	0.04	0.04	0.04
P49A	TRU-C Separations	3	160	0.18	0.83	0.60	0.83
P49C	Class C Grout Plant	2	160	0.12	0.52	0.60	0.52
P49D	Class C Grout Packaging & Shipping to INEEL Disposal Facility	2	160	0.02	0.32	0.06	0.32
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P118	Separations Organic Incinerator	2	8	0.01	0.10	0.03	0.10
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.1×10^3	0.69	4.2	1.7	4.2
Hot Isostatic Pressed Waste Option							
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.19	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P71	Mixing and HIPing	5	160	0.15	1.1	1.0	1.1
P72	HIP HLW Interim Storage	Unknown	160	0.07	0.86	0	0.86
P73A	Packaging and Loading HIP Waste at INTEC for Shipment to NGR	Unknown	140	0.05	0.04	0.08	0.04
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.4×10^3	0.79	4.9	2.6	4.9

Table 5.3-17. Utility and energy requirements for dispositioning of new facilities (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
Direct Cement Waste Option							
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.19	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P80	Direct Cement Process	3	160	0.14	0.92	0.60	0.92
P81	Unseparated Cementitious HLW Interim Storage	Unknown	160	0.12	1.6	0	1.6
P83A	Packaging & Loading Cementitious Waste at INTEC for Ship. to NGR	Unknown	140	0.05	0.04	0.08	0.04
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.4×10^3	0.82	5.5	1.8	5.5
Early Vitrification Option							
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P61	Unseparated Vitrified HLW Interim Storage	Unknown	160	0.10	1.4	0	1.4
P62A	Packaging/Loading Vitrified HLW at INTEC for Shipment to NGR	Unknown	140	0.05	0.05	0.08	0.05
P88	Early Vitrification with MACT Upgrades	5	180	0.20	0.66	0.70	0.66
P90A	Packaging & Loading Vitrified SBW at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	140	0.05	0.04	0.04	0.04
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.1×10^3	0.65	3.8	1.2	3.8

Table 5.3-17. Utility and energy requirements for dispositioning of new facilities (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
Minimum INEEL Processing Alternative							
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P24	Vitrified Product Interim Storage at INEEL	Unknown	160	0.03	0.17	0	0.17
P25A	Packaging & Loading Vitrified HLW and INTEC for Shipment to NGR	Unknown	39	0	3.0×10^{-3}	0	3.0×10^{-3}
P27	Class A Grout Disposal in New INEEL Disposal Facility	Unknown	1	0.06	0.76	0	0.76
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P111	SBW & NGLW Treatment with CsIX to CH TRU Grout and LLW Grout	1	180	0.07	0.59	0.20	0.59
P112A	Packaging and Loading CH TRU for Shipment to the Waste Isolation Pilot Plant	4.5	140	0.05	0.04	0.04	0.04
P117A	Packaging and Loading Calcine for Transport to Hanford Site	3	160	9.0×10^{-3}	0.29	0.80	0.29
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.1×10^{3}	0.47	3.5	1.4	3.5

CH TRU = contact-handled transuranic waste; CsIX = cesium ion exchange; HIP = hot isostatic press; MACT = Maximum Achievable Control Technology; NGLW = newly generated liquid waste; NGR = national geologic repository; NWCF = New Waste Calcining Facility; SBW = sodium-bearing waste; TRU = transuranic waste; TRU-C = transuranic/Class C.

Table 5.3-18. Summary of annual resource impacts from dispositioning existing facilities with multiple disposition alternatives.

Facility	Units	Clean closure	Performance-based closure	Closure to landfill standards	Performance-based closure with Class A grout disposal	Performance-based closure with Class C grout disposal
Tank Farm	Years (duration)	26	17	17	22	22
Wastewater discharges	Million gallons per year	2.0	0.13	0.10	0.14	0.15
Annual potable water use	Million gallons per year	2.0	0.11	0.06	0.13	0.14
Annual process water use	Million gallons per year	0.05	0.06	0.09	0.05	0.05
Annual fossil fuel use	Million gallons per year	0.08	0.02	0.011	0.010	0.010
Annual electricity use	Megawatt-hours per year	7.3×10^{3}	4.4×10^{3}	1.2×10^{3}	4.6×10^{3}	4.6×10^{3}
Bin sets	Years (duration)	27	21	21	22	22
Wastewater discharges	Million gallons per year	0.32	0.32	0.16	0.52	0.56
Annual potable water use	Million gallons per year	0.32	0.31	0.15	0.52	0.55
Annual process water use	Million gallons per year	3.9×10^{-3}	0.01	0.011	0.03	0.03
Annual fossil fuel use	Million gallons per year	3.9×10^{-3}	6.6×10^{-3}	5.2×10^{-3}	5.2×10^{-3}	5.0×10^{-3}
Annual electricity use	Megawatt-hours per year	3.2×10^{3}	6.0×10^{3}	990	1.5×10^{3}	1.5×10^{3}
Fuel Processing Building and Related Facilities	Years (duration)	NA[a]	10	10	NA	NA
Wastewater discharges	Million gallons per year	NA	6.0×10^{-3}	4.8×10^{-3}	NA	NA
Annual potable water use	Million gallons per year	NA	6.0×10^{-3}	4.8×10^{-3}	NA	NA
Annual process water use	Million gallons per year	NA	0	0	NA	NA
Annual fossil fuel use	Million gallons per year	NA	0.26	0.26	NA	NA
Annual electricity use	Megawatt-hours per year	NA	0	0	NA	NA
New Waste Calcining Facility	Years (duration)	NA	5	5	NA	NA
Wastewater discharges	Million gallons per year	NA	0.01	0.01	NA	NA
Annual potable water use	Million gallons per year	NA	0.01	0.01	NA	NA
Annual process water use	Million gallons per year	NA	0	0	NA	NA
Annual fossil fuel use	Million gallons per year	NA	0.09	0.09	NA	NA
Annual electricity use	Megawatt-hours per year	NA	300	300	NA	NA

a. NA = not applicable.

Table 5.3-19. Summary of resource impacts from dispositioning other existing facilities associated with HLW management.

Facility Group	Duration of dispositioning activity[a] (years)	Annual wastewater discharges (million gallons per year)	Annual potable water use (million gallons per year)	Annual process water use (million gallons per year)	Annual fossil fuel use (million gallons per year)	Annual electricity use (megawatt-hours per year)
Tank Farm-Related Facilities	6	7.4×10^{-4}	7.4×10^{-4}	0	0.16	0
Bin Set-Related Facilities	6	5.0×10^{-5}	5.0×10^{-5}	0	0.13	0
Process Equipment Waste Evaporator and Related Facilities	6	0.02	0.02	0	0.17	0
Fluorinel and Storage Facility and Related Facilities	6	0.01	0.01	0	0.09	0
Remote Analytical Laboratory	5	2.1×10^{-3}	2.1×10^{-3}	0	0.06	0
Transport Lines Group	1	3.6×10^{-3}	3.6×10^{-3}	0	0.06	0

a. Duration refers to total number of calendar years during which dispositioning of facilities within the listed groups would occur.

Table 5.3-20. Summary of waste generated from the dispositioning new waste processing facilities.[a]

Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters) Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
Continued Current Operations Alternative						
P1A	Calcine SBW including New Waste Calcining Facility Upgrades	3	1.1×10^3	620	0	200
P1B	Newly Generated Liquid Waste Management and Tank Farm Heel Waste	1	3.7×10^3	5.0×10^3	11	60
	Totals		4.8×10^3	5.6×10^3	11	260
Full Separations Option						
P9A	Full Separations	3	2.4×10^4	3.1×10^4	350	11
P9B	Vitrification Plant	3	1.4×10^4	1.8×10^4	42	6
P9C	Class A Grout Plant	2.5	6.0×10^3	7.9×10^3	18	3
P118	Separations Organic Incinerator	2	0	0	15	0
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P24	Vitrified Product Interim Storage	3	9.4×10^3	0	0	2
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	0.33	10	0	0	3
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P133	Waste Treatment Pilot Plant	2	5.4×10^3	6.7×10^3	22	3
For onsite facility disposal of grout						
P27	Class A Grout Disposal in a new Low-Activity Waste Disposal Facility	2	130	0	0	0
P35D	Class A Grout Packaging and Shipping to a new Low-Activity Waste Disposal Facility	2	670	0	0	0
For tank farm and bin set disposal of grout						
P26	Class A Grout Disposal in Tank Farm and Bin Sets	4	3.7×10^3	0	350	20
For offsite disposal of grout						
P35E	Class A Grout Packaging and Loading for Offsite Disposal	2	670	0	0	0
	Totals					
	Base case – New INEEL disposal of Class A grout		6.7×10^4	6.8×10^4	550	28
	Tank Farm and bin set disposal of Class A grout		7.0×10^4	6.8×10^4	900	48
	Offsite disposal of Class A grout		6.7×10^4	6.8×10^4	550	28

Table 5.3-20. Summary of waste generated from the dispositioning new waste processing facilities[a] (continued).

Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters)			
			Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
Planning Basis Option						
P1A	Calcine SBW including New Waste Calcining Facility Upgrades	3	1.1×10^{3}	630	0	200
P1B	Treatment of Newly Generated Liquid Waste and Tank Farm Waste Heel Waste	1	3.7×10^{3}	5.0×10^{3}	11	60
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P23A	Full Separations	2	2.3×10^{4}	3.1×10^{4}	320	15
P23B	Vitrification Plant	2	1.4×10^{4}	1.8×10^{4}	8	6
P23C	Class A Grout Plant	2	6.0×10^{3}	7.9×10^{3}	12	3
P24	Vitrified Product Interim Storage	3	9.4×10^{3}	0	0	2
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	0.33	12	0	0	3
P59A	Calcine Retrieval and Transport	2	3.6×10^{3}	0	0	0
P118	Separations Organic Incinerator	2	0	1	15	0
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
P35E	Class A Grout Packaging and Loading for Offsite Disposal	2	670	0	0	0
	Totals		7.2×10^{4}	7.3×10^{4}	480	290
Transuranic Separations Option						
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P49A	Transuranic/Class C Separations	3	2.0×10^{4}	2.7×10^{4}	200	9
P49C	Class C Grout Plant	2	6.0×10^{3}	7.9×10^{3}	18	3
P118	Separations Organic Incinerator	2	0	0	15	0
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
P39A	Packaging and Loading Transuranic Waste at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	170	0	0	15
P59A	Calcine Retrieval and Transport	1	3.6×10^{3}	0	0	0
For onsite facility disposal of grout						
P27	Class A Grout Disposal in a new Low-Activity Waste Disposal Facility	2	130	0	0	0
P49D	Class C Grout Packaging and Shipping to a new Low-Activity Waste Disposal Facility	2	700	0	0	0
For tank farm and bin set disposal of grout						
P51	Class C Grout Placement in Tank Farm and Bin Sets	4	3.7×10^{3}	0	350	20
For offsite disposal of grout						
P49E	Class C Grout Packaging and Loading for Offsite Disposal	2	1.1×10^{3}	0	0	0

Table 5.3-20. Summary of waste generated from the dispositioning new waste processing facilities[a] (continued).

Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters)			
			Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
Hot Isostatic Pressed Waste Option						
P1A	Calcine SBW including New Waste Calcining Facility Maximum Achievable Control Technologies Upgrades	3	1.1×10^3	630	0	200
P1B	Newly Generated Liquid Waste Management (low-level waste grout) and Tank Farm Heel Waste	1	3.7×10^3	5.0×10^3	11	60
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P71	Mixing and Hot Isostatic Pressing	5	2.6×10^4	3.5×10^4	210	12
P72	Interim Storage of Hot Isostatic Pressed Waste	3	2.3×10^4	0	0	4
P73A	Packaging and Loading of Hot Isostatic Pressed Waste at INTEC for Shipment to a Geologic Repository	2.5	580	0	0	68
P133	Waste Treatment Pilot Plant	2	5.4×10^3	6.7×10^3	22	3
Total			6.8×10^4	5.0×10^4	340	340
Direct Cement Waste Option						
P1A	Calcine SBW including New Waste Calcining Facility Upgrades	3	1.1×10^3	620	0	200
P1B	Newly Generated Liquid Waste Management and Tank Farm Heel Waste	1	3.7×10^3	5.0×10^3	11	60
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P80	Direct Cement Process	3	2.5×10^4	3.4×10^4	220	11
P81	Unseparated Cementious HLW Interim Storage	3	5.1×10^4	0	0	24
P83	Packaging and Loading of Cementitious Waste at INTEC for Shipment to a Geologic Repository	3.5	860	0	0	110
P133	Waste Treatment Pilot Plant	2	5.4×10^3	6.7×10^3	22	3
Total			9.5×10^4	4.9×10^4	350	410
Early Vitrification Option						
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P88	Early Vitrification with Maximum Achievable Control Technology	5	2.3×10^4	3.0×10^4	360	11
P61	Vitrified HLW Interim Storage	3	4.3×10^4	0	0	22
P62A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	3	430	0	0	110
P90A	Packaging and Loading SBW at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	170	0	0	15
P133	Waste Treatment Pilot Plant	2	5.4×10^3	6.7×10^3	22	3
Total			8.0×10^4	4.1×10^4	480	160

Table 5.3-20. Summary of waste generated from the dispositioning new waste processing facilities[a] (continued).

Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters): Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
	Minimum INEEL Processing Alternative					
P111	SBW and Newly Generated Liquid Waste Treatment with Cesium Ion Exchange to Contact Handled Transuranic Grout and Low-Level Waste Grout	1	3.7×10^3	5.0×10^3	15	2
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P27	Class A Grout Disposal in New INEEL Low-Activity Waste Disposal Facility (for vitrified low-level waste fraction)	2	130	0	0	0
P24	Interim Storage of Vitrified Waste at INEEL	3	9.4×10^3	0	0	2
P25A	Packaging and Loading of Vitrified HLW at INTEC for Shipment to a Geologic Repository	0.33	12	0	0	3
P112A	Packaging and Loading Contact Handled Transuranic Waste for Transport to the Waste Isolation Pilot Plant	4.5	880	0	0	0
P117A	Calcine Packaging and Loading	3	140	110	8	46
P133	Waste Treatment Pilot Plant	2	5.4×10^3	6.7×10^3	22	3
Total			2.8×10^4	1.5×10^4	140	56

a. Source: Project Data Sheets in Appendix C.6.

Table 5.3-21. Waste generated for existing HLW facilities by facility and disposition alternative.[a]

	Duration of activity (years)	Total waste generation per waste type[b] (in cubic meters)			
		Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
Tank Farm					
Clean Closure	26	1.6×10^5	1.1×10^3	1.1×10^4	0
Performance-Based Closure	17	1.9×10^3	0	120	79
Closure to Landfill Standards	17	1.7×10^3	0	480	0
Performance-Based Closure with Class A Grout Disposal	22	1.5×10^3	0	120	27
Performance-Based Closure with Class C Grout Disposal	22	1.5×10^3	0	120	27
Tank Farm Related Facilities	8[c]	56	100	0	1
Bin Sets					
Clean Closure	27	2.4×10^4	4.6×10^3	180	130
Performance-Based Closure	21	3.6×10^3	150	85	100
Closure to Landfill Standards	21	3.6×10^3	150	33	100
Performance-Based Closure with Class A Grout Disposal	22	1.5×10^4	0	540	28
Performance-Based Closure with Class C Grout Disposal	22	1.5×10^4	0	540	28
Bin Set Related Facilities	6	0	10	0	0.2
Process Equipment Waste Evaporator and Related Facilities[d]	6	870	2.5×10^3	0	13
Fuel Processing Building and Related Facilities	10	0	920	0	18
Fluorinel Dissolution Process and Fuel Storage and Related Facilities	6	0	1.5×10^3	0	33
Remote Analytical Laboratory	5	0	100	0	2
New Waste Calcining Facility	5	0	2.4×10^3	460	250
Transport Line Group	1	0	9	43	0

a. Unless otherwise specified, the source of the data presented is the Project Data Sheets in Appendix C.6.
b. As presented here, the quantities of waste generated during dispositioning do not include building debris and other building material buried in place.
c. Dispositioning of the Tank Farm-related facilities would occur over eight different, non-consecutive years. Most facilities would, however, be dispositioned during the 6-year period from January 2018 through December 2023.
d. Source of data for Process Waste Equipment Evaporator, CPP-604, (combined with related facilities here): Haley (1998).

and would be long-term actions, lasting upwards of 30 years, depending on the alternative. Because of these complexities, the Tank Farm and bin sets are being evaluated under each of the five disposition alternatives. Other existing waste processing facilities are generally only being considered for a single disposition alternative as shown in Table 3-4. The exception to this is the facility grouping Fuel Processing Building and related facilities and the New Waste Calcining Facility. The Fuel Processing Building and Related Facilities were considered under two disposition alternatives: Performance-Based Closure and Closure to Landfill Standards. The group is shown with a single entry in Table 5.3-21 because the quantities of waste generated would be identical under either disposition alternative. The New Waste Calcining Facility was also evaluated for the same two disposition alternatives and, again, the quantities of waste generated under either alternative were projected to be the same. Disposition of these other facilities would not be long-term actions compared to the Tank Farm and bin sets.

Disposition of new and existing waste processing facilities would produce large quantities of industrial waste. Depending on the waste processing alternative and the facility disposition alternative considered for the Tank Farm and bin sets, projected volumes of industrial waste could exceed 250,000 cubic meters. This is greater than the quantities projected for construction and operation of the waste processing alternatives as described in Section 5.2.13. However, much of these materials would be construction debris and, as discussed in Section 5.2.13, should not present a serious problem for disposal within the INEEL.

The highest combined projections of low-level waste generated from facility disposition actions would be about 85,000 cubic meters. This is a significant volume in comparison to the DOE-wide projection of 1.5 million cubic meters over a 20-year period that was described in Section 5.2.13. However, the 85,000 cubic meter quantity would be generated over even a longer period of time and, also as discussed in Section 5.2.13, DOE assumes that new facilities would be constructed if additional treatment and disposal capacity is needed.

The projected quantities of mixed low-level waste vary greatly under the various facility disposition alternatives. The largest volume shown for either new or existing facilities is for clean closure of the Tank Farm, which is estimated to produce about 10,600 cubic meters of mixed low-level waste. As discussed in Section 5.2.13, DOE assumes that new facilities would be constructed if additional mixed low-level waste treatment and disposal capacity is needed. Planning documents for clean closure of the Tank Farm identify almost 134,000 cubic meters of CERCLA waste soil that may be associated with this disposition alternative. This waste, which would likely be contaminated with both hazardous and radiological constituents, is not included in Table 5.3-21 under the assumption that it would be addressed and, as appropriate, remediated under INEEL's CERCLA program.

Quantities of hazardous waste produced under any of the facility disposition alternatives would be relatively small, particularly when spread over the number of years that it would take to implement the actions. The annual volumes would be similar to those discussed in Section 5.2.13 for construction and operation activities. Similarly, it is unlikely these additional wastes would adversely impact the ability of commercial facilities to manage hazardous waste.